

# PATENT ABSTRACTS OF JAPAN

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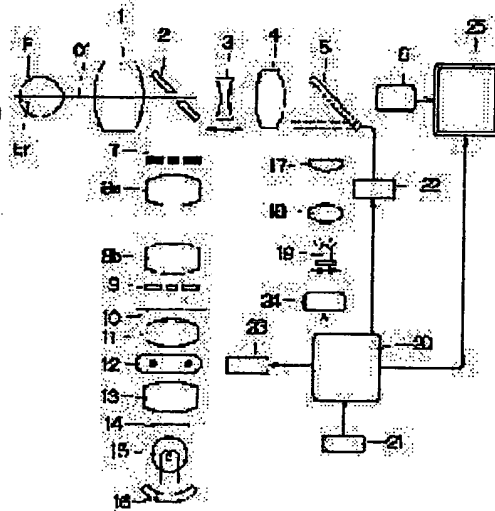
(72)Inventor : NISHIHARA YUTAKA

## (54) OPHTHALMOLOGICAL CAMERA

### (57)Abstract:

**PROBLEM TO BE SOLVED:** To enable inspection of eyegrounds in a wide range by a method wherein a synthetic image arrayed based on the position of photographing eyes to be inspected is produced each time an image of the eyes to be inspected recorded in a recording means is photographed and displayed on an image display means to allow the generation of a panorama image positioned accurately.

**SOLUTION:** At an image control section 25, a retinal image taken by CCD6 is stored into a frame memory and added to by a position data or the like of a fixation lamp 19 to be recorded into a recorder. The retinal image is displayed at coordinates corresponding to the position data of the fixation lamp 19 on a TV monitor. The image taken is displayed on the monitor by a control part 25 in duplication sequentially while a photographing area selection index is displayed. This index varies in display position interlocking the operation of the fixation lamp 19 so that eyes E to be inspected can be induced by adjusting the index to a desired part yet to be photographed. When all of the photographing ends, a panorama image of the retinal image is displayed on the monitor.



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(71) 出願人 000001007

キヤノン株式会社

東京都大田区下丸子3丁目30番2号

(72) 発明者 西原 裕

神奈川県川崎市中原区今井上町53番地 キ

ヤノン株式会社小杉事業所内

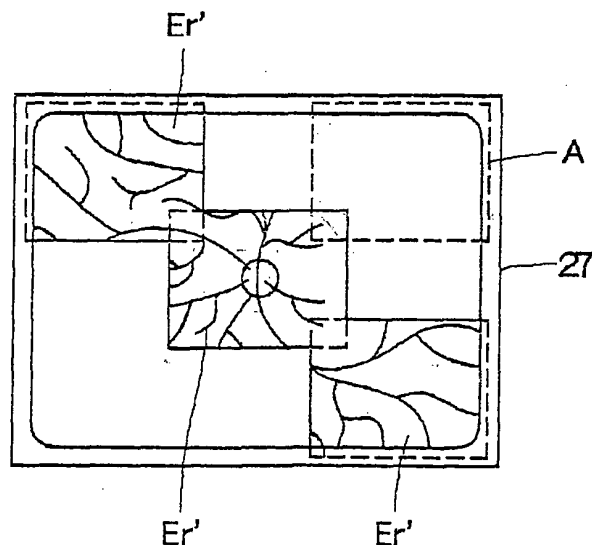
(74) 代理人 弁理士 日比谷 征彦

(54) 【発明の名称】 眼科撮影装置

(57) 【要約】

【目的】 簡便な操作で正確に位置決めしたパノラマ画像を作成する。

【構成】 検査者は固視灯の投影位置を変化させて被検眼 E を誘導し、所望の観察撮影部位を選択する。CCD 6 によって撮像された被検眼の眼底像をフレームメモリに記憶し、固視灯の位置データと、キーボードによって入力された日付や被検者のデータを付加して、記録装置に記録する。また、画像制御部はテレビモニタ 27 上に座標を設定し、固視灯の位置データに対応した座標に眼底像 Er' を表示する。このような手順により、所望の観察撮影部位を順次に撮影してゆく。このとき画像制御部はテレビモニタ 27 上に後から撮影された画像を前に撮影した画像と重複して表示する。全ての撮影が終了すると、テレビモニタ 27 上には眼底像 Er' のパノラマ画像が得られ、検査者はこのパノラマ画像を用いて眼底の広い範囲を検査する。



## 【特許請求の範囲】

【請求項1】 被検眼を照明する照明手段と、該照明手段により照明された被検眼を撮影する撮影手段と、被検眼の撮影位置を選択する位置選択手段と、該位置選択手段で選択された被検眼の撮影位置と前記撮影手段で撮影された被検眼像を記録する記録手段と、該記録手段に記録された前記被検眼像を撮影毎に被検眼の撮影位置に基づいて配列した合成画像を作成する画像制御手段と、該画像制御手段により作成された合成画像を表示する画像表示手段とを設けたことを特徴とする眼科撮影装置。

【請求項2】 被検眼を照明する照明手段と、該照明手段により照明された被検眼を撮影する撮影手段と、被検眼の撮影位置を選択する位置選択手段と、該位置選択手段で選択された被検眼の撮影位置と前記撮影手段で撮影された被検眼像を記録する記録手段と、該記録手段に記録された被検眼像を撮影毎に被検眼の撮影位置に基づいて配列した合成画像を作成する画像制御手段と、前記撮影手段の撮影可能な範囲を示す指標と、該指標を被検眼の撮影位置に基づいて前記合成画像に合成する指標制御手段と、前記合成画像と前記指標を表示する画像表示手段とを設けたことを特徴とする眼科撮影装置。

【請求項3】 被検眼を照明する照明手段と、該照明手段により照明された被検眼を撮影する撮影手段と、被検眼の撮影位置を選択する位置選択手段と、該位置選択手段で選択された被検眼の撮影位置と前記撮影手段で撮影された被検眼像を記録する記録手段と、該記録手段に記録された被検眼像を撮影毎に被検眼の撮影位置に基づいて配列した合成画像を作成する画像制御手段と、該画像制御手段により作成された合成画像と前記撮影手段で撮

像されるアライメント画像を切換えて表示する画像表示手段とを設けたことを特徴とする眼科撮影装置。

【請求項4】 前記位置選択手段は呈示位置が可変な固視標とした請求項1に記載の眼科撮影装置。

【請求項5】 前記位置選択手段は前記撮影手段を被検眼を中心に旋回動可能とした請求項1に記載の眼科撮影装置。

【請求項6】 前記撮影手段は電子撮像素子とした請求項1に記載の眼科撮影装置。

【請求項7】 前記表示切換手段は架台の移動に連動するようにとした請求項3に記載の眼科撮影装置。

## 【発明の詳細な説明】

## 【0001】

【発明の属する技術分野】本発明は、眼科医院や集団検診等で使用される眼科撮影装置に関するものである。

## 【0002】

【従来の技術】従来から眼底カメラによる眼底検査では、被検眼の後極部を中心とした撮影を行い検査するのが一般的である。しかし、より広い範囲の検査をしたい場合には、検査者が周辺部を撮影できるように眼底カメラを調節したり、固視標を用いて被検眼を誘導するなどし

て周辺部を複数個所に渡って連続撮影し、得られた画像を貼り合わせて合成し、パノラマ画像を作成してこれを用いて検査するようにしている。

## 【0003】

【発明が解決しようとする課題】しかしながら、上述の従来の検査方法においては、得られた画像を貼り合わせ合成する作業が煩わしく、更に合成する位置を間違える可能性があるなど、眼底を広い範囲で検査したい場合の問題になっている。

10 【0004】本発明の目的は、上述の問題点を解消し、簡便な操作で正確に位置決めしたパノラマ画像を作成でき、これによって広い範囲で眼底を検査することができる眼科撮影装置を提供することにある。

## 【0005】

【課題を解決するための手段】上記の目的を達成するための第1発明に係る眼科撮影装置は、被検眼を照明する照明手段と、該照明手段により照明された被検眼を撮影する撮影手段と、被検眼の撮影位置を選択する位置選択手段と、該位置選択手段で選択された被検眼の撮影位置と前記撮影手段で撮影された被検眼像を記録する記録手段と、該記録手段に記録された前記被検眼像を撮影毎に被検眼の撮影位置に基づいて配列した合成画像を作成する画像制御手段と、該画像制御手段により作成された合成画像を表示する画像表示手段とを設けたことを特徴とする。

20 【0006】第2発明に係る眼科撮影装置は、被検眼を照明する照明手段と、該照明手段により照明された被検眼を撮影する撮影手段と、被検眼の撮影位置を選択する位置選択手段と、該位置選択手段で選択された被検眼の撮影位置と前記撮影手段で撮影された被検眼像を記録する記録手段と、該記録手段に記録された被検眼像を撮影毎に被検眼の撮影位置に基づいて配列した合成画像を作成する画像制御手段と、前記撮影手段の撮影可能な範囲を示す指標と、該指標を被検眼の撮影位置に基づいて前記合成画像に合成する指標制御手段と、前記合成画像と前記指標を表示する画像表示手段とを設けたことを特徴とする。

30 【0007】第3発明に係る眼科撮影装置は、被検眼を照明する照明手段と、該照明手段により照明された被検眼を撮影する撮影手段と、被検眼の撮影位置を選択する位置選択手段と、該位置選択手段で選択された被検眼の撮影位置と前記撮影手段で撮影された被検眼像を記録する記録手段と、該記録手段に記録された被検眼像を撮影毎に被検眼の撮影位置に基づいて配列した合成画像を作成する画像制御手段と、該画像制御手段により作成された合成画像と前記撮影手段で撮像されるアライメント画像を切換えて表示する画像表示手段とを設けたことを特徴とする。

## 【0008】

50 【発明の実施の形態】本発明を図示の実施例に基づいて

詳細に説明する。図1は第1の実施例の無散瞳眼底カメラの構成図である。被検眼Eの前方の光路01上には、対物レンズ1、中心開口を有する孔あきミラー2、光路01に沿って可動なフォーカシングレンズ3、撮影レンズ4、撮影時に下方に降下するハーフミラー5、CCD6が順次に配設され、観察撮影光学系が形成されている。ここで、ハーフミラー5は赤外光を100%透過し、可視光を50%反射、50%透過する特性を有している。

【0009】孔あきミラー2の入射方向の光路02上には、孔あきミラー2側から角膜バッフル7、リレーレンズ8a、8b、水晶体バッフル9、円環状開口を有するリングスリット10、コンデンサレンズ11、キセノン管等から成る撮影光源12、コンデンサレンズ13、赤外光が透過する赤外フィルタ14、ハロゲンランプ等から成る照明光源15、凹面反射鏡16が順次に設けられ、照明光学系が形成されている。

【0010】ハーフミラー5の入射方向の光路03上には、フィールドレンズ17、レンズ18、被検眼Eを所望の観察撮影部位へと誘導するための可視光源から成る固視灯19が設けられ、固視灯投影系が形成されている。

【0011】更に、電気回路として機能制御部20が設けられ、この機能制御部20には図示しないジョイスティックに設けられ撮影時に操作される撮影スイッチ21の出力が接続され、機能制御部20の出力は撮影光源12の光量を制御する光量制御部23、固視灯19の投影位置を制御する固視灯制御部24、CCD6の出力を処理する画像制御部25に接続されている。

【0012】固視灯制御部24は図2に示すように構成され、固視灯19とレバー部26が支点Cを中心に回転運動自在に支えられており、検者は固視灯制御部24を介してレバー部26を操作することにより、固視灯19の呈示位置を変化させて、被検眼Eの視線を所望の観察撮影部位へと導くことができるようになっている。

【0013】図3は画像制御系の構成図であり、画像制御部25にはCCD6、機能制御部20の出力が接続され、更にテレビモニタ27、フレームメモリ28、キーボード29、記録装置30、マウス31が接続されている。

【0014】照明光源15を点灯すると、照明光源15及び凹面反射鏡16で反射された光束は、赤外フィルタ14によって赤外光束とされ、光路02を経て孔あきミラー2によって反射され、被検眼Eの眼底Erを照明する。眼底Erからの反射光束は光路01を経てハーフミラー5を透過し、CCD6の撮像面に結像する。

【0015】また、機能制御部20、固視灯制御部24によって固視灯19が指定位置で点灯され、フィールドレンズ17上で一旦結像された後に、ハーフミラー5で一部が反射され、光路01を経て被検眼Eの眼底Erに投影される。ここで、固視灯19は被検眼Eに相対され、注

視のよりどころとなっており、検者は固視灯制御部24により固視灯19の投影位置を変化させて被検眼Eを誘導し、所望の観察撮影部位を選択する。眼底Erで反射した固視灯19による光束は、光路01を経て一部がハーフミラー5を透過し、CCD6の撮像面に結像される。

【0016】CCD6の出力は画像制御部25に伝えられ、画像制御部25は赤外光で照明した被検眼Eの眼底像と固視灯19の像をテレビモニタ27上に表示する。このとき、画像制御部25はCCD6の撮像面に結像されている固視灯19の位置を検出している。

【0017】図4はテレビモニタ27上に表示された被検眼Eの眼底像Er'と固視灯19の像19aを示している。検者はテレビモニタ27上に表示された眼底像を観察し、被検眼Eと眼底カメラの光軸を合わせる所謂アライメント及び作動距離合わせ等の眼底撮影のための準備を行う。撮影準備が整うと、検者は撮影スイッチ21を操作する。撮影スイッチ21の出力は機能制御部20に伝えられ、機能制御部20はミラー駆動部22によってハーフミラー5を破線で示す位置に退避させ、光量制御部23によって撮影光源12を発光すると共に、撮影状態になったことを画像制御部25に伝える。画像制御部25は機能制御部20からの信号を受け静止画像を取り込む準備をする。

【0018】撮影光源12の光束は、光路02を経て孔あきミラー2によって反射され、被検眼Eの眼底Erに到達する。眼底Erからの反射光は光路01を経て、CCD6の撮像面上に被検眼Eの眼底像が結像される。

【0019】画像制御部25はCCD6によって撮像された被検眼Eの眼底像をフレームメモリ28に記憶し、固視灯19の位置データと、キーボード29によって入力された日付や被検者のデータを付加して、記録装置30に記録する。また、画像制御部25はテレビモニタ27上に座標を設定し、固視灯19の位置データに対応した座標に眼底像Er'を表示する。即ち、固視灯19の呈示位置が変われば、それに対応してテレビモニタ27上で眼底像Er'の表示位置が変化する。

【0020】このような手順により、所望の観察撮影部位を順次に撮影してゆく。このとき、図5に示すように画像制御部25はテレビモニタ27上に後から撮影された画像を前に撮影した画像と重複して表示するようにしているので、未撮影部分を確認でき、撮影部位の撮り忘れや重複を防ぐことができる。更に、テレビモニタ27上には、撮影可能範囲を示す撮影エリア選択指標Aが表示される。この撮影エリア選択指標Aは固視灯19の操作に連動して表示位置が変化するものであり、検者は撮影エリア選択指標Aを所望の未撮影部分へ調節することにより、被検眼Eを所望の位置に誘導できる。

【0021】また、この状態から撮影スイッチ21を操作すると、アライメントのために画像制御部26が、テレビモニタ27上に図4に示すような観察画像を表示す

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るように制御している。本実施例では、撮影スイッチ 21 を表示画像切換えのスイッチとして兼用しているが、専用のスイッチを設けてもよいし、アライメントのためのステージの移動に連動するようにすることもできる。また、アライメント用モニタと記録画像表示用モニタを別に設けるようにしてもよい。

【0022】全ての撮影が終了すると、テレビモニタ 27 上には図 6 に示すような眼底像  $E_r'$  のパノラマ画像が得られ、検査はこのパノラマ画像を用いて眼底  $E_r$  の広い範囲を検査することができる。また、検査で眼底  $E_r$  の疾患を見付けた場合に、テレビモニタ 27 上で疾患のある部分の画像をキーボード 29 やマウス 31 で選択すると、画像制御部 25 により選択された部分の画像がテレビモニタ 27 の画面全体に表示され、検査者は疾患部分を高倍率で精密に検査できる。

【0023】本実施例においては、図 2 で説明したような固視灯制御部 24 によって固視灯を呈示し、CCD 6 と画像制御部 25 によって固視灯の位置検出を行ったが、この固視灯制御部 24 に図 7 に示すように固視灯 19 の移動量を検出する位置検出センサ 32 を付加して、固視灯 19 の投影位置を知るようにしてもよい。

【0024】また、固視灯制御部 24 として図 8、図 9 に示すような固視灯 33 と液晶シャッタ 34 を設けて、機能制御部 20 によって液晶シャッタ 34 の開口部 A と多数個の遮光部 B の位置を制御し、固視灯 19 の呈示と位置検出を行うようにすることもできる。

【0025】また、固視灯制御部 24 として図 10、図 11 に示すような複数の LED から成る固視灯 35 を設けて、機能制御部 20 によって固視用 LED 35a、35b、35c、・・・の点灯部と消灯部を制御し、固視灯 35 の呈示と位置検出を行うようにしてもよい。

【0026】更に、上述の実施例では内部固視灯を利用するものとしたが、固視灯制御部 24 の代りに、図 12、図 13 に示すように対物レンズ 1 の近傍に眼底カメラの光軸を中心としてリング状に複数個の LED を配置した固視灯 36 を設けて、機能制御部 20 によって固視用 LED 36a、36b、36c、・・・の点灯部と消灯部を制御し、固視灯の呈示と位置検出を行うようにすれば、外部固視灯によっても撮影を実施することができる。

【0027】

【発明の効果】以上説明したように本発明の眼科撮影装

6

置は、煩わしい作業を伴わず、しかも正確に位置が決められたパノラマ画像を作成することができ、被検眼を広い範囲で検査することが容易になる。また、画像表示手段には撮影された画像を逐次に重複して表示するようにしているので、検査者は容易に未撮影部分を確認することができ、パノラマ画像作成に必要な画像の撮り忘れを防ぐことができる。更に、被検者の固視不良や失敗撮影等による不良画像についても確認することができるので、直ちにやり直しができるなど作業性が向上する。

【図面の簡単な説明】

【図 1】実施例の眼底カメラの構成図である。

【図 2】固視灯制御部の構成図である。

【図 3】画像制御系の構成図である。

【図 4】テレビモニタ上の正面図である。

【図 5】パノラマ画像作成の説明図である。

【図 6】パノラマ画像と映出したテレビモニタの正面図である。

【図 7】他の実施例の固視灯制御部の構成図である。

【図 8】固視灯の側面図である。

【図 9】固視灯の正面図である。

【図 10】固視灯の側面図である。

【図 11】固視灯の正面図である。

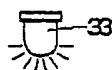
【図 12】固視灯の側面図である。

【図 13】固視灯の正面図である。

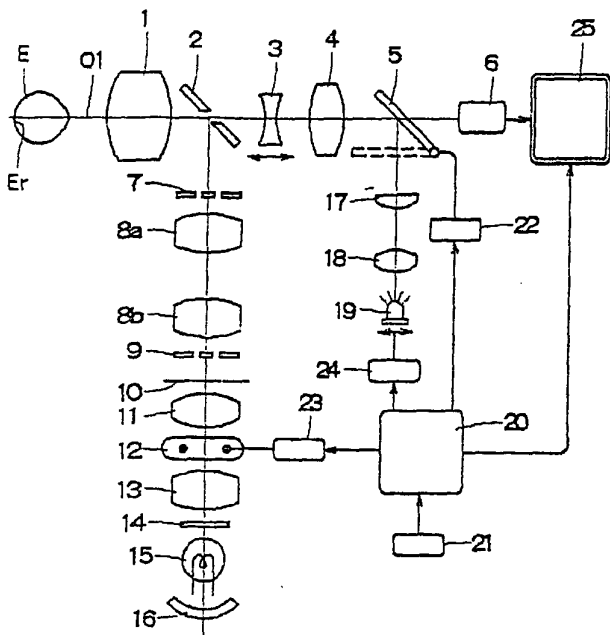
【符号の説明】

- 1 対物レンズ
- 6 CCD
- 12 撮影光源
- 14 赤外フィルタ
- 15 照明光源
- 19、33、35、36 固視灯
- 20 機能制御部
- 21 撮影スイッチ
- 23 光量制御部
- 24 固視灯制御部
- 25 画像制御部
- 27 テレビモニタ
- 28 フレームメモリ
- 30 記録装置
- 32 位置検出センサ
- 37 撮影エリア選択指標

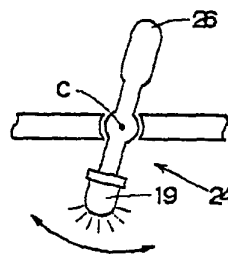
【図 8】



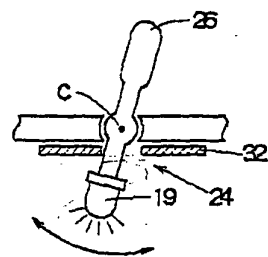
【図1】



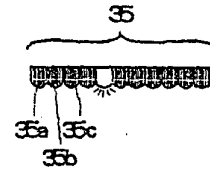
【図2】



【図7】

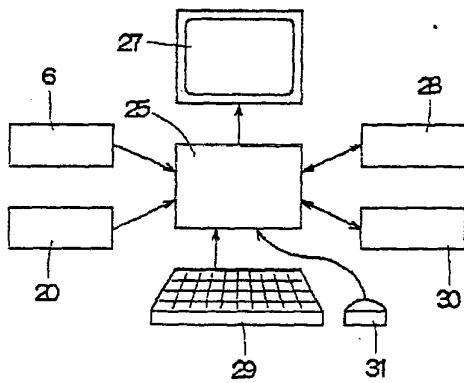


【図10】

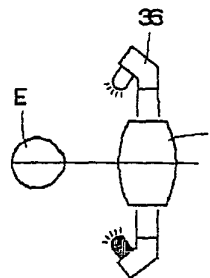
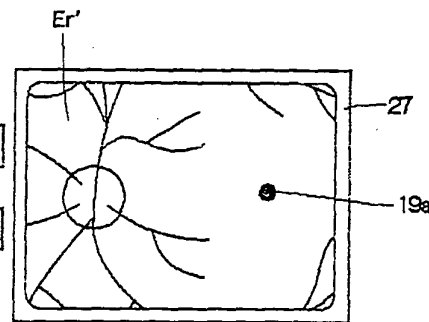


【図12】

【図3】

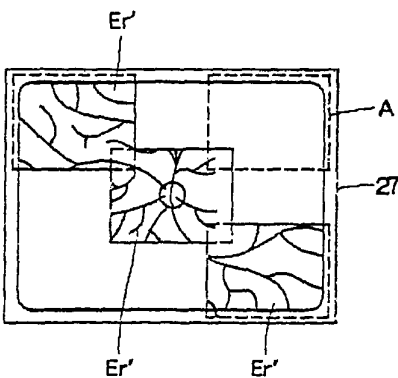


【図4】

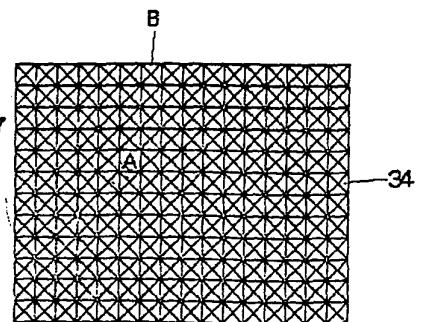
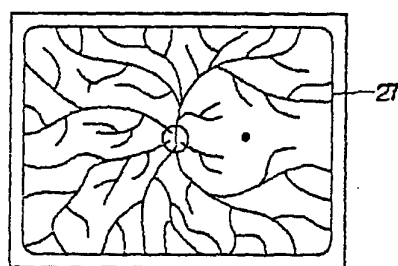


【図9】

【図5】



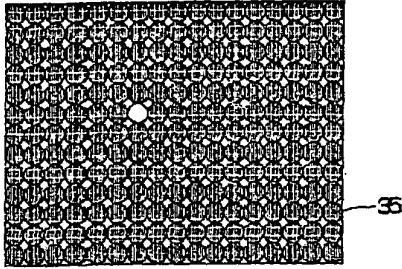
【図6】



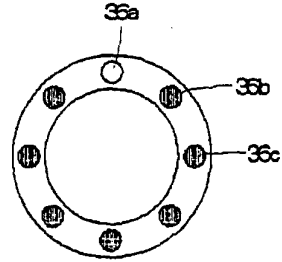
(6)

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【図11】



【図13】





## PATENT ABSTRACTS OF JAPAN

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(51)Int.Cl.

A61B 3/14

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 claim

(21)Application number : 07-350277

(71)Applicant : CANON INC

(22)Date of filing : 22.12.1995

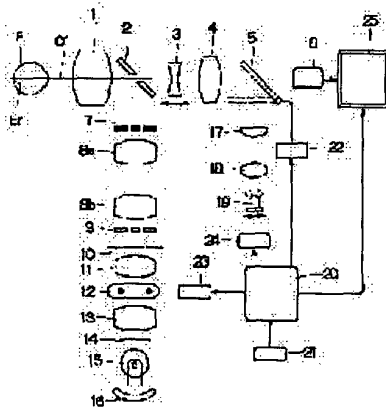
(72)Inventor : NISHIHARA YUTAKA

## (54) OPHTHALMOLOGICAL CAMERA

## (57)Abstract:

PROBLEM TO BE SOLVED: To enable inspection of eyegrounds in a wide range by a method wherein a synthetic image arrayed based on the position of photographing eyes to be inspected is produced each time an image of the eyes to be inspected recorded in a recording means is photographed and displayed on an image display means to allow the generation of a panorama image positioned accurately.

SOLUTION: At an image control section 25, a retinal image taken by CCD6 is stored into a frame memory and added to by a position data or the like of a fixation lamp 19 to be recorded into a recorder. The retinal image is displayed at coordinates corresponding to the position data of the fixation lamp 19 on a TV monitor. The image taken is displayed on the monitor by a control part 25 in duplication sequentially while a photographing area selection index is displayed. This index varies in display position interlocking the operation of the fixation lamp 19 so that eyes E to be inspected can be induced by adjusting the index to a desired part yet to be photographed. When all of the photographing ends, a panorama image of the retinal image is displayed on the monitor.



## LEGAL STATUS

[Date of request for examination]

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]

[Date of final disposal for application]

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of rejection]

[Date of requesting appeal against examiner's decision of rejection]

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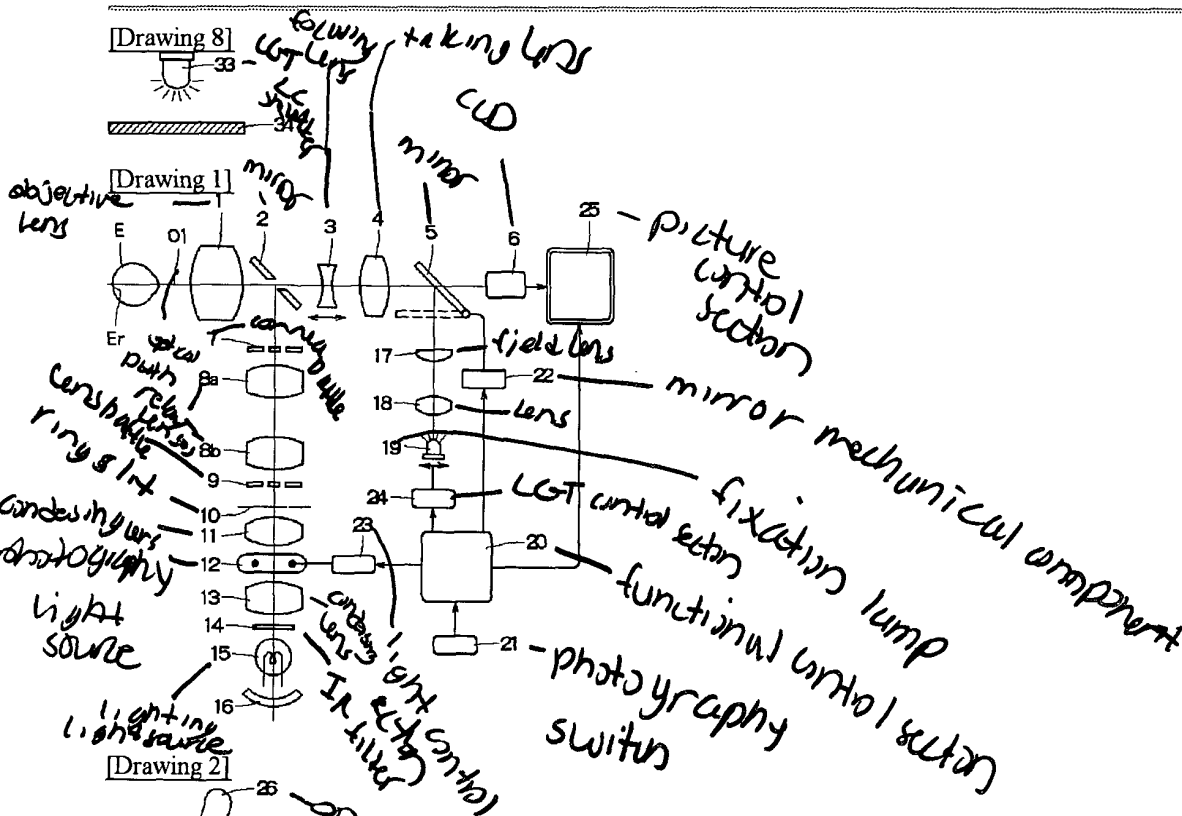
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DRAWINGS

[Drawing 8]



[Drawing 1]



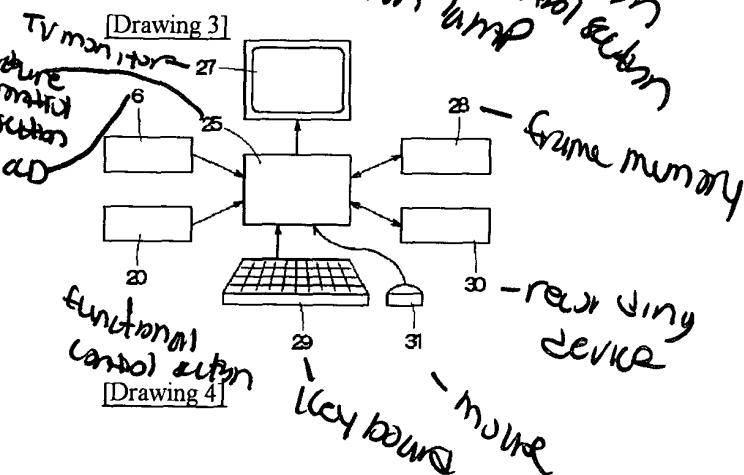
[Drawing 2]



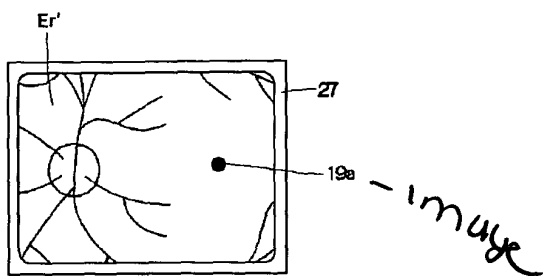
[Drawing 3]



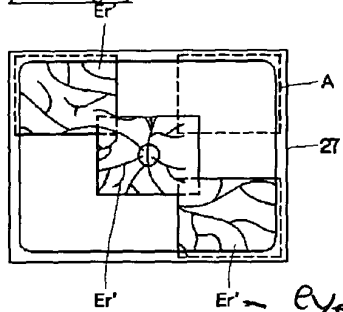
[Drawing 4]



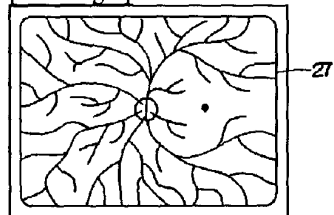




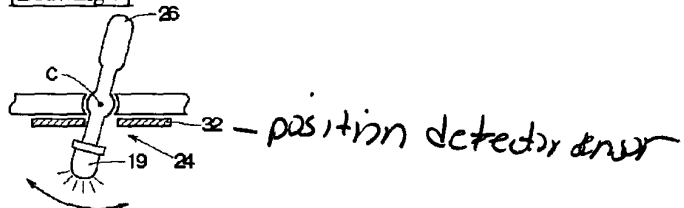
[Drawing 5]



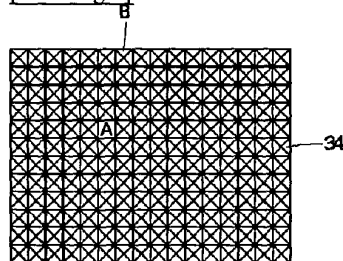
[Drawing 6]



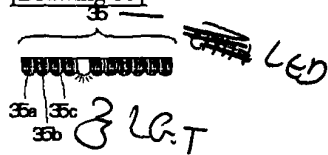
[Drawing 7]



[Drawing 9]

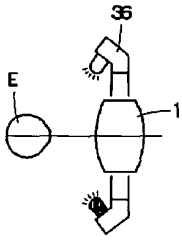


[Drawing 10]

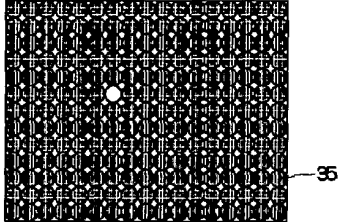


[Drawing 12]

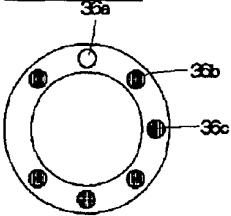




[Drawing 11]



[Drawing 13]



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DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] It is the block diagram of the fundus camera of an example.

[Drawing 2] It is the block diagram of a fixation LGT control section.

[Drawing 3] It is the block diagram of a picture control system.

[Drawing 4] It is the front view on a television monitor.

[Drawing 5] It is explanatory drawing of panorama picture creation.

[Drawing 6] It is the front view of a panorama picture and the television monitor which projected.

[Drawing 7] It is the block diagram of the fixation LGT control section of other examples.

[Drawing 8] It is the side elevation of a fixation LGT.

[Drawing 9] It is the front view of a fixation LGT.

[Drawing 10] It is the side elevation of a fixation LGT.

[Drawing 11] It is the front view of a fixation LGT.

[Drawing 12] It is the side elevation of a fixation LGT.

[Drawing 13] It is the front view of a fixation LGT.

[Description of Notations]

1 Objective Lens

6 CCD

12 Photography Light Source

14 Infrared Filter

15 Lighting Light Source

19, 33, 35, 36 Fixation LGT

20 Functional Control Section

21 Photography Switch

23 Light-Control Section

24 Fixation LGT Control Section

25 Picture Control Section

27 Television Monitor

28 Frame Memory

30 Recording Device

32 Position Detection Sensor

37 Photography Area Selection Index

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[The technical field to which invention belongs] this invention relates to the ophthalmology photography equipment used by the ophthalmology hospital, the mass screening, etc.

[0002]

[Description of the Prior Art] It is common to perform photography centering on the stella-lentis-hyaloidea section examined the eyes in the examination of the fundus by the fundus camera from the former, and to inspect. However, optometry-ed is guided using a fixation label, the seriography of the periphery is carried out over two or more places, a fundus camera is adjusted, or the acquired picture is stuck and is compounded so that a \*\* person can photo a periphery, a panorama picture is created, and it is made to inspect using this to inspect the latus range more.

[0003]

[Problem(s) to be Solved by the Invention] However, in the above-mentioned conventional inspection method, the work which carries out lamination composition of the acquired picture is troublesome, and it has been a problem in the case of wanting to inspect eyegrounds in the latus range that there is possibility of making a mistake in the position compounded further etc.

[0004] The purpose of this invention cancels an above-mentioned trouble, can create the panorama picture correctly positioned by simple operation, and is to offer the ophthalmology photography equipment which can inspect eyegrounds in the latus range by this.

[0005]

[Means for Solving the Problem] The ophthalmology photography equipment concerning the 1st invention for attaining the above-mentioned purpose A lighting means to illuminate optometry-ed, and a photography means to photo the optometry-ed illuminated by this lighting means, A record means to record the image photoed with a position selection means to choose the photography position examined the eyes, and a photography position and the aforementioned photography means examined [ which was chosen with this position selection means ] the eyes examined the eyes, It is characterized by establishing the picture control means which create the synthetic picture which arranged the aforementioned image recorded on this record means examined the eyes based on the photography position examined the eyes for every photography, and an image display means to display the synthetic picture created by these picture control means.

[0006] A lighting means by which the ophthalmology photography equipment concerning the 2nd invention illuminates optometry-ed, and a photography means to photo the optometry-ed illuminated by this lighting means, A record means to record the image photoed with a position selection means to choose the photography position examined the eyes, and a photography position and the aforementioned photography means examined [ which was chosen with this position selection means ] the eyes examined the eyes, The picture control means which create the synthetic picture which arranged the image recorded on this record means examined the eyes based on the photography position examined the eyes for every photography, It is characterized by establishing the index which shows the range which can photo the aforementioned photography means, the index control means which compound this index in the aforementioned synthetic picture based on the photography position examined the eyes, and an image display means to display the aforementioned synthetic picture and the aforementioned index.

[0007] A lighting means by which the ophthalmology photography equipment concerning the 3rd invention illuminates optometry-ed, and a photography means to photo the optometry-ed illuminated by this lighting means, A record means to record the image photoed with a position selection means to choose the photography position examined the eyes, and a photography position and the aforementioned photography means examined [ which was chosen with this position selection means ] the eyes examined the eyes, The picture control means which create the synthetic picture which arranged the image recorded on this record means examined the eyes based on the photography position examined the eyes for every photography, It is characterized by establishing an image display means to switch and display the synthetic picture created by these picture control means and the alignment picture picturized with the aforementioned photography means.

[0008]

[Embodiments of the Invention] this invention is explained in detail based on the example of illustration. Drawing 1 is the block diagram of the non-mydrasis fundus camera of the 1st example. the hole which has an objective lens 1 and main opening on the optical path O1 of the front examined [ E ] the eyes -- along with the vacancy mirror 2 and the optical path O1, the movable focusing glass 3, a taking lens 4, the one-way mirror 5 that descends caudad at the time of photography, and CCD6 are arranged



one by one, and observation photography optical system is formed Here, a one-way mirror 5 penetrates infrared light 100%, and has reflection and the property penetrated 50% for the light 50%.

[0009] a hole -- the optical-path O2 top of the direction of incidence of the vacancy mirror 2 -- a hole -- the lighting light source 15 and the lieberkuhn 16 which consist of the photography light source 12 which consists of the cornea baffle 7, relay lenses 8a and 8b, the lens baffle 9, the ring slit 10 that has in-a-circle opening, a condensing lens 11, a xenon pipe, etc., a condensing lens 13, the infrared filter 14 which infrared light penetrates, a halogen lamp, etc. be prepared one by one from the vacancy mirror 2

[0010] On the optical path O3 of the direction of incidence of a one-way mirror 5, fixation LGT 19 which consists of the visible light source for guiding to the field lens 17, a lens 18, and the observation photography part of a request of the optometry E-ed is formed, and the fixation LGT projection system is formed.

[0011] Furthermore, the output of the photography switch 21 which the functional control section 20 is formed as an electrical circuit, is formed in the joystick which is not illustrated to this functional control section 20, and is operated at the time of photography is connected, and the output of the functional control section 20 is connected to the light-control section 23 which controls the quantity of light of the photography light source 12, the fixation LGT control section 24 which controls the projection position of fixation LGT 19, and the picture control section 25 process the output of CCD6.

[0012] The fixation LGT control section 24 is constituted as shown in drawing 2, fixation LGT 19 and the lever section 26 support it free [ rotation ] focusing on the supporting point C, a \*\* person can change the presentation position of fixation LGT 19 by operating the lever section 26 through the fixation LGT control section 24, and it can lead now the visual axis examined [ E ] the eyes to a desired observation photography part.

[0013] Drawing 3 is the block diagram of a picture control system, the output of CCD6 and the functional control section 20 is connected to the picture control section 25, and a television monitor 27, the frame memory 28, the keyboard 29, the recording device 30, and the mouse 31 are connected further.

[0014] if the lighting light source 15 is turned on, the flux of light reflected by the lighting light source 15 and the lieberkuhn 16 should be made an infrared light bunch by the infrared filter 14, and should pass an optical path O2 by it -- a hole -- it is reflected by the vacancy mirror 2 and the eyegrounds Er examined [ E ] the eyes are illuminated The reflected light bunch from Eyegrounds Er penetrates a one-way mirror 5 through an optical path O1, and it carries out image formation to the image pck-up side of CCD6.

[0015] Moreover, once the functional control section 20 and the fixation LGT control section 24 light up in the specified position and image formation of fixation LGT 19 is carried out on the field lens 17, a part is reflected by the one-way mirror 5, and it is projected on the eyegrounds Er examined [ E ] the eyes through an optical path O1. Here, fixation LGT 19 is checked by looking by the optometry E-ed, serves as a ground of a gaze, a \*\* person changes the projection position of fixation LGT 19 by the fixation LGT control section 24, and guides the optometry E-ed, and chooses a desired observation photography part. Through an optical path O1, a part penetrates a one-way mirror 5 and image formation of the flux of light by fixation LGT 19 reflected by Eyegrounds Er is carried out to the image pck-up side of CCD6.

[0016] The output of CCD6 is told to the picture control section 25, and the picture control section 25 displays the eyegrounds image examined [ E ] the eyes and the image of fixation LGT 19 which were illuminated by infrared light on a television monitor 27. At this time, the picture control section 25 has detected the position of fixation LGT 19 by which image formation is carried out to the image pck-up side of CCD6.

[0017] Drawing 4 is eyegrounds image Er' examined [ which was displayed on the television monitor 27 / E ] the eyes. Image 19a of fixation LGT 19 is shown. A \*\* person observes the eyegrounds image displayed on the television monitor 27, and makes the preparations for eyegrounds photography, such as the so-called alignment which doubles the optical axis of the optometry E-ed and a fundus camera, and working distance doubling. If photography preparation is completed, a \*\* person will operate the photography switch 21. The output of the photography switch 21 is told to the functional control section 20, and while the functional control section 20 makes it evacuate to the position which shows a one-way mirror 5 with a dashed line by the mirror mechanical component 22 and emitting light in the photography light source 12 by the light-control section 23, it tells having changed into the photography state to the picture control section 25. The picture control section 25 makes the preparations which receive the signal from the functional control section 20, and incorporate a static image.

[0018] the flux of light of the photography light source 12 should pass an optical path O2 -- a hole -- it is reflected by the vacancy mirror 2 and the eyegrounds Er examined [ E ] the eyes are reached As for the reflected light from Eyegrounds Er, image formation of the eyegrounds image examined [ E ] the eyes is carried out on the image pck-up side of CCD6 through an optical path O1.

[0019] The picture control section 25 memorizes the eyegrounds image examined [ which was picturized by CCD6 / E ] the eyes to a frame memory 28, adds the position data of fixation LGT 19, and the data of the date or the subject inputted by the keyboard 29, and records them on a recording device 30. Moreover, the picture control section 25 is eyegrounds image Er' to the coordinate corresponding to [ set up a coordinate on a television monitor 27 and ] the position data of fixation LGT 19. It displays. That is, if the presentation position of fixation LGT 19 changes, it corresponds to it, and it is eyegrounds image Er' on a television monitor 27. A display position changes.

[0020] With such a procedure, a desired observation photography part is photoed one by one. As shown in drawing 5 at this time, since the picture control section 25 overlaps the picture photoed with the picture near at hand by which back shell photography was carried out and it is made to display it on a television monitor 27, it can check the portion non-taken a photograph and can prevent a failure to photograph and duplication of a photography part. Furthermore, on a television monitor 27, the photography



area selection index A which shows the range which can be photoed is displayed. Operation of fixation LGT 19 is interlocked with, a display position changes, and a \*\* person can guide this photography area selection index A to the position of a request of the optometry E-ed by adjusting the photography area selection index A to the desired portion non-taken a photograph.

[0021] Moreover, if the photography switch 21 is operated from this state, the picture control section 26 will control to display an observation picture as shown on a television monitor 27 at drawing 4 for alignment. In this example, although the photography switch 21 is made to serve a double purpose as a switch of a display image change, the switch of exclusive use may be formed and movement of the stage for alignment can be interlocked with. Moreover, you may make it form independently the monitor for alignment, and the monitor for record image display.

[0022] Eyegrounds image Er' after all photography is completed, as shown on a television monitor 27 at drawing 6 A panorama picture is acquired and a \*\* person can inspect the latus range of Eyegrounds Er using this panorama picture. Moreover, if the picture of the portion which has a disorder on a television monitor 27 is chosen with a keyboard 29 or a mouse 31 when the disorder of Eyegrounds Er is found by inspection, the picture of the portion chosen by the picture control section 25 is displayed on the whole screen of a television monitor 27, and a \*\* person can inspect a disorder portion precisely for a high scale factor.

[0023] Although the fixation LGT was shown by the fixation LGT control section 24 which was explained by drawing 2 and CCD6 and the picture control section 25 performed position detection of a fixation LGT, as shown in drawing 7, the position detection sensor 32 which detects the movement magnitude of fixation LGT 19 is added to this fixation LGT control section 24, and you may make it know the projection position of fixation LGT 19 in this example.

[0024] Moreover, fixation LGT 33 and the liquid crystal shutter 34 as shown in drawing 8 and drawing 9 as a fixation LGT control section 24 are formed, the position of the opening A of the liquid crystal shutter 34 and many shading sections B is controlled by the functional control section 20, and presentation and position detection of fixation LGT 19 can be performed.

[0025] Moreover, fixation LGT 35 which consists of two or more Light Emitting Diodes as shown in drawing 10 and drawing 11 as a fixation LGT control section 24 is formed, Light Emitting Diodes 35a, 35b, and 35c for fixation, and the lighting section and the putting-out-lights section of ... are controlled by the functional control section 20, and it may be made to perform presentation and position detection of fixation LGT 35.

[0026] Furthermore, although an internal fixation LGT shall be used in the above-mentioned example Fixation LGT 36 which has arranged two or more Light Emitting Diodes to the shape of a ring focusing on the optical axis of a fundus camera near the objective lens 1 instead of the fixation LGT control section 24 as shown in drawing 12 and drawing 13 is formed. If Light Emitting Diodes 36a, 36b, and 36c for fixation, and the lighting section and the putting-out-lights section of ... are controlled by the functional control section 20 and it is made to perform presentation and position detection of a fixation LGT, a photograph can be taken also with an external fixation LGT.

[0027]

[Effect of the Invention] As explained above, the ophthalmology photography equipment of this invention cannot be accompanied by troublesome work, but the panorama picture the position was moreover correctly decided to be can be created, and it becomes easy to inspect optometry-ed in the latus range. Moreover, since serial is overlapped and it is made to display the photoed picture on an image display means, a \*\* person can check the portion non-taken a photograph easily, and can prevent a failure of a picture required for panorama picture creation to photograph. Furthermore, since it can check also about the poor picture by the poor fixation of the subject, failure photography, etc., workability -- restarting is possible immediately -- improves.

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CLAIMS

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[Claim(s)]

[Claim 1] Ophthalmology photography equipment characterized by providing the following. A lighting means to illuminate an eye examination-ed. A photography means to photo the eye examination-ed illuminated by this lighting means. A position selection means to choose the photography position examined the eyes. The picture control means which create in the synthetic picture which arranged the aforementioned image recorded on the photography position examined [ which was chosen with this position selection means ] the eyes, a record means record the image photoed with the aforementioned photography means examined the eyes, and this record means examined the eyes based on the photography position examined the eyes for every photography, and an image-display means display the synthetic picture created by these picture control means.

[Claim 2] Ophthalmology photography equipment characterized by providing the following. A lighting means to illuminate an eye examination-ed. A photography means to photo the eye examination-ed illuminated by this lighting means. A position selection means to choose the photography position examined the eyes. The photography position examined [ which was chosen with this position selection means ] the eyes, and a record means to record the image photoed with the aforementioned photography means examined the eyes, The picture control means which create the synthetic picture which arranged the image recorded on this record means examined the eyes based on the photography position examined the eyes for every photography, The index which shows the range which can photo the aforementioned photography means, the index control means which compound this index in the aforementioned synthetic picture based on the photography position examined the eyes, and an image display means to display the aforementioned synthetic picture and the aforementioned index.

[Claim 3] Ophthalmology photography equipment characterized by providing the following. A lighting means to illuminate an eye examination-ed. A photography means to photo the eye examination-ed illuminated by this lighting means. A position selection means to choose the photography position examined the eyes. The image-display means switch and display the picture control means which create in the synthetic picture which arranged the image recorded on the photography position examined [ which was chosen with this position selection means ] the eyes, a record means record the image photoed with the aforementioned photography means examined the eyes, and this record means examined the eyes based on the photography position examined the eyes for every photography, the synthetic picture which were created by these picture control means, and the alignment picture which are picturized with the aforementioned photography means.

[Claim 4] The aforementioned position selection means is ophthalmology photography equipment according to claim 1 made into \*\*\*\*\* with a presentation position strange good.

[Claim 5] The aforementioned position selection means is ophthalmology photography equipment according to claim 1 which made \*\*\*\*\* of the aforementioned photography means possible the center [ an eye examination-ed ].

[Claim 6] The aforementioned photography means is ophthalmology photography equipment according to claim 1 used as the electronic image pck-up element.

[Claim 7] The aforementioned display means for switching are ophthalmology photography equipment according to claim 3 it was presupposed that is interlocked with movement of a stand.

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[Translation done.]

